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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/664,503	09/17/2003	Paul Taichiang Yu	GP-302212	4683

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EXAMINER
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AKRAM, IMRAN

ART UNIT	PAPER NUMBER
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1795

MAIL DATE	DELIVERY MODE
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05/30/2008

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/664,503	<b>Applicant(s)</b> YU ET AL.	
	<b>Examiner</b> IMRAN AKRAM	<b>Art Unit</b> 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 10 April 2008.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) 11-19 and 24-28 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10 and 20-23 is/are rejected.
- 7) ☒ Claim(s) 8 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 17 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Applicant's election without traverse of Group I, claims 1-10 and 20-23 in the reply filed on 4/10/08 is acknowledged.

### ***Claim Objections***

2. Claim 8 is objected to because of the following informalities: a comma is missing after 300°C. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 112***

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 3 and 23 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

5. Claim 3 recites the limitation "the catalyst" in claim 1. There is insufficient antecedent basis for this limitation in the claim as there are multiple catalysts being referred to as one. For the purposes of examination it is assumed that claim 3 reads "the catalysts are" not "the catalyst is."

6. Claim 23 recites the limitation "the catalyst" in claim 20. There is insufficient antecedent basis for this limitation in the claim as there are multiple catalysts being

referred to as one. For the purposes of examination it is assumed that claim 23 reads “the catalysts are” not “the catalyst is.”

***Claim Rejections - 35 USC § 102***

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8. Claims 1, 3-10, 20, 21, and 23 are rejected under 35 U.S.C. 102(e) as being anticipated by Seaba (US 2002/0168307 A1).

9. Regarding claim 1, Seaba discloses a water-gas shift reactor system comprising: a first stage water-gas shift reactor **42** receiving a reformat gas, said first stage reactor including a catalyst that converts carbon monoxide and water to carbon dioxide and hydrogen (paragraph 25); a heat exchanger **46** receiving the reformat gas from the first stage reactor, said heat exchanger cooling the reformat gas (paragraph 25), said heat exchanger including a catalyst **46A** that converts carbon monoxide and water to carbon dioxide and hydrogen (Table II); and a second stage water-gas shift reactor **50** receiving the cooled reformat gas from the heat exchanger, said second stage reactor including a catalyst that converts carbon monoxide and water to carbon dioxide and hydrogen (paragraph 25).

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10. Regarding claim 3, Seaba discloses the catalysts to be either precious metals Pt and/or Pd and CuO (see Table II).

11. Regarding claims 4 and 8-10, the recitations with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus. See Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

12. Regarding claim 5, Seaba discloses that the first stage reactor is a high temperature reactor operating at 450°C and the second stage reactor is a low temperature reactor operating at 250°C (see figure 2).

13. Regarding claim 6, Seaba discloses that the water-gas shift reactor system is part of a fuel processing system for producing hydrogen for a fuel cell (see figure 1).

14. Regarding claim 7, Seaba discloses that the water-gas shift reactor system is positioned between a primary reactor **34** and a preferential oxidation **60** reactor in the fuel processing system (see figure 1).

15. Regarding claim 20, Seaba discloses a fuel processing system for producing a hydrogen reformat gas, said system comprising: a primary reactor **34**, said primary reactor receiving a liquid hydrocarbon fuel and generating a reformat gas including hydrogen and carbon monoxide (paragraph 24); a first heat exchanger **38**, said first heat exchanger receiving the reformat gas from the primary reactor and cooling the reformat gas (paragraph 25); a water-gas shift reactor assembly including a first stage water-gas shift reactor **42** receiving the cooled reformat gas from the first heat exchanger, a second heat exchanger **46** receiving the reformat gas from the first stage

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reactor, said second heat exchanger cooling the reformat gas, and a second stage water-gas shift reactor **50** receiving the cooled reformat gas from the second heat exchanger (paragraph 25), each of the first stage reactor, second heat exchanger and second stage reactor including a catalyst that converts carbon monoxide and water to carbon dioxide and hydrogen (see Table II); a third heat exchanger **54**, said third heat exchanger receiving the reformat gas from the second stage reactor and cooling the reformat gas (paragraph 25); and a preferential oxidation reactor **60**, said preferential oxidation reactor receiving the cooled reformat gas from the third heat exchanger, said preferential oxidation reactor including a catalyst that selectively oxidizes carbon monoxide to carbon dioxide in the reformat gas (see Table II).

16. Regarding claim 21, Seaba discloses that the first heat exchanger includes a catalyst **38A** that converts carbon monoxide and water to carbon dioxide and hydrogen (see Table II).

17. Regarding claim 23, Seaba discloses the catalysts to be either precious metals Pt and/or Pd and CuO (see Table II).

### ***Claim Rejections - 35 USC § 103***

18. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

20. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

21. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

22. Claims 2 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Seaba as applied to claims 1 and 20, respectively, above, and further in view of Valensa (US 2004/0089438 A1) and applicant's admitted prior art.

23. While Seaba discloses heat exchangers with plates and tubes of various configurations (see figures 3), Seaba does not disclose the heat exchanger to be a tube and fin heat exchanger or a bar and plate heat exchanger. Applicant admits these types of heat exchangers to be well known in the prior art (paragraph 28 of specification), however, and Valensa is one such example. Valensa discloses an invention for a heat

exchanger for reforming as a bar-plate combination (paragraph 49) and a tube-fin combination (paragraph 50). It would have been obvious to one having ordinary skill in the art at the time of invention to form the heat exchangers of Seaba in the configuration of Valensa to increase heat exchange efficiency as these types of heat exchangers are admittedly known in the art.

24. Claims 4 and 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Seaba as applied to claim 1 above.

25. Seaba discloses the use of water in the heat exchangers (paragraph 25). Seaba does not, however, disclose the shift reactors to operate between the temperatures of 300 and 400 degrees Celsius. Seaba discloses varying temperatures and ranges for optimal conditions (paragraph 34), though, and so it would have been obvious to one having ordinary skill in the art at the time of invention to modify the device of Seaba to operate at whatever temperatures appropriate for maximum efficiency of hydrogen production--the most desirable feature in the reforming art. Optimization of parameters such as temperature is a well-known, obvious modification to a device: See MPEP 2144.05 II A.

26. Claims 1, 4-6, and 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eguchi (US 5,221,524) in view of Hunter (US 4,288,346).

27. Regarding claim 1, Eguchi discloses a water-gas shift reactor system (Fig. 3A) comprising: a first stage water-gas shift reactor 1a receiving a reformat gas, said first stage reactor including a catalyst 2a that converts carbon monoxide and water to carbon dioxide and hydrogen; a heat exchanger 5 receiving the reformat gas from the



first stage reactor; and a second stage water-gas shift reactor 7 receiving the cooled reformat gas from the heat exchanger, said second stage reactor including a catalyst 8 that converts carbon monoxide and water to carbon dioxide and hydrogen (Fig. 3A, CI/L35-65), but does not explicitly disclose said heat exchanger including a catalyst that converts carbon monoxide and water to carbon dioxide and-hydrogen.

28. Hunter discloses a heat exchanger including a catalyst that converts carbon monoxide and water to carbon dioxide and hydrogen (Fig. 2, C6/L50-68), and it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Eguchi with Hunter for the purpose to provide a catalytic heat exchanger wherein a rapid subtraction of heat is required to improve energy efficiency (CI/L1-C2/L4).

29. Regarding claims 4, 5 and 8-10, the recitations with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus. See Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

30. Regarding claim 6, Eguchi discloses the water-gas shift reactor system is part of a fuel processing system for producing hydrogen for a fuel cell (Fig. 3A, CI/L35-65).

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to IMRAN AKRAM whose telephone number is (571)270-3241. The examiner can normally be reached on 10-7 Monday through Friday.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on 571-272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

IA

/Alexa D. Neckel/  
Supervisory Patent Examiner, Art Unit 1795